PATTERN RECOGNITION

THE JOURNAL OF THE PATTERN RECOGNITION SOCIETY

VOLUME CONTENTS AND AUTHOR INDEX

VOLUME 26 (1993)

PERGAMON PRESS Oxford New York Seoul Tokyo

PATTERN RECOGNITION
The Journal of the Pattern Recognition Society

Editor-in-Chief: ROBERT S. LEDLEY
National Biomedical Research Foundation, Georgetown University Medical Center, Washington, DC

Managing Editor: BLAIRE V. MOSSMAN
P.O. Box 13177, Scottsdale, AZ 85267-3177

Associate Editors

KEIICHI ABE, Japan
M. AHMADI, Canada
SHUHEI AIDA, Japan
YIANNIS ALOIMONOS, U.S.A.
MASAYOSHI AOKI, Japan
ROBERT H. ASENDORF, U.S.A.
HENRY S. BAIRD, U.S.A.
HENRY M. BEISNER, U.S.A.
J. ROSS BEVERIDGE, U.S.A.
BIR BHANU, U.S.A.
ZHAOQI BIAN, China
CAROLYN M. BJORKLUND, U.S.A.
RONALD BLANFORD, U.S.A.
ALAN C. BOVIK, U.S.A.
KEVIN W. BOWYER, U.S.A.
ERNESTO BRIBIESCA, Mexico
ALFRED BRUCKSTEIN, Israel
J. BRYANT, U.S.A.
MICHAEL BUAS, U.S.A.
TERRY CAELLI, Australia
E. R. CAIANIELLO, Italy
VIRGINIO CANTONI, Italy
HOMER H. CHEN, U.S.A.
SU-SHING CHEN, U.S.A.
KNUT CONRADSEN, Denmark
GIUSEPPE A. DEBIASE, Italy
EDWARD J. DELP, U.S.A.
R. C. DUBES, U.S.A.
STANLEY DUNN, U.S.A.
MASAKAZU EJIRI, Japan
KURT ENSLEIN, U.S.A.
MARTIN A. FISCHLER, U.S.A.
HERBERT FREEMAN, U.S.A.
JOYDEEP GHOSH, U.S.A.
MARK L. GILLENSON, U.S.A.
LEV GOLDFARB, Canada
ERIK GRANUM, Denmark
LALIT GUPTA, U.S.A.
ADOLFO GUZMAN, U.S.A.
EDWIN HANCOCK, U.K.
ANDREW J. HANSON, U.S.A.
J. P. HATON, France
WILLIAM A. HOFF, U.S.A.
JAMES H. HOWARD, JR, U.S.A.
JONATHAN J. HULL, U.S.A.
ANIL K. JAIN, U.S.A.
RAMESH JAIN, U.S.A.
R. S. JOHANNES, U.S.A.
MOSHE KAM, U.S.A.
KLARA KEDEM, Israel
H. R. KESHAVAN, U.S.A.
J. V. KITTLER, U.K.
JACK KOPLOWITZ, U.S.A.
ADAM KRZYZAK, Canada
JAMES S. J. LEE, U.S.A.
REINER LENZ, Sweden
JIA-GUU LEU, U.S.A.
S. LEVIALDI, Italy
MARTIN D. LEVINE, Canada
C. C. LI, U.S.A.
XIAOBO LI, Canada
GUY LORETTE, France
ROBERT MACDONALD, U.S.A.
MICHAEL MAGEE, U.S.A.
ABHIJIT MAHALANOBIS, U.S.A.
HENRI MAITRE, France
JOHN W. MARTIN, U.S.A.
PETER MEER, U.S.A.
ROGER MOHR, France
RICHARD MOORE, U.S.A.
JEAN-VINCENT MOREAU, France
SHIGEO MORISHIMA, Japan
RANDY MOSS, U.S.A.
MORTON NADLER, U.S.A.
RAMAKANT NEVATIA, U.S.A.
PATRICK L. ODELL, U.S.A.
HIDEMITSU OGAWA, Japan
DAVID W. PAGLIERONI, U.S.A.
Y.-H. PAO, U.S.A.
CHAN M. PARK, Korea
M. PAWLAK, Canada
YUN PENG, U.S.A.
MICHAEL A. PENNA, U.S.A.
JEROME K. PERCUS, U.S.A.
JIM PIPER, U.K.
REJEAN PLAMONDON, Canada
TING-CHUEN PONG, Hong Kong
S. RAUDYS, Lithuania
J. A. REGGIA, U.S.A.
CELSO RIBEIRO, Brazil
MICHAEL ROBINSON, U.S.A.
A. ROSENFELD, U.S.A.
FRANK H. RUDDLE, U.S.A.
DENIS RUTOVITZ, U.K.
HANAN SAMET, U.S.A.
ISHWAR K. SETHI, U.S.A.
LINDA G. SHAPIRO, U.S.A.
YOSHIAKI SHIRAI, Japan
B. SHIU, U.S.A.
M. SHRIDHAR, U.S.A.
JACK SKLANSKY, U.S.A.
MICHAEL SPANN, U.K.
SARGUR N. SRIHARI, U.S.A.
RENATO STEFANELLI, Italy
GEORGE STOCKMAN, U.S.A.
CHING Y. SUEN, Canada
KOKICHI SUGIHARA, Japan
SHINICHI TAMURA, Japan
STEVEN L. TANIMOTO, U.S.A.
TORFINN TAXT, Norway
GODFRIED T. TOUSSAINT, Canada
MOHAN M. TRIVEDI, U.S.A.
WEN-HSIANG TSAI, Taiwan
LEONARD UHR, U.S.A.
SCOTT UMBAUGH, U.S.A.
ANDREW M. WALLACE, U.K.
HARRY WECHSLER, U.S.A.
ROLAND WILSON, U.K.
YEE-HONG YANG, Canada
NAOKAZU YOKOYA, Japan
DEAN M. YOUNG, U.S.A.
MARSHALL YOVITS, U.S.A.

Published Monthly

Copyright © 1993 *Pattern Recognition Society*

Subscription Rates
Annual Institutional Subscription Rates 1994: North, Central and South America, U.S. $995.00, Rest of the World £647.00. Associated Personal Subscription Rates are available on request for those whose institutions are library subscribers. Sterling prices exclude VAT. Non-VAT registered customers in the European Community will be charged the appropriate VAT in addition to the price listed. Prices include postage and insurance and are subject to change without notice. Members of the Pattern Recognition Society will receive the journal free of charge as part of their membership to the Society. Subscription enquiries from customers in North America should be sent to: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A., and for the remainder of the world to: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, U.K.

Publishing and Advertising Offices. *American Continent*: Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A. *Rest of the World*: Pergamon Press Ltd, Headington Hill Hall, Oxford OX3 0BW, U.K.

Microform and Back Issues. Back issues of all previously published volumes, in both hard copy and on microform, are available direct from Pergamon Press offices.

Second-class postage paid at RAHWAY NJ. Postmaster send address corrections to Pattern Recognition, c/o Pergamon Press Inc., 660 White Plains Road, Tarrytown, NY 10591-5153, U.S.A.

VOLUME CONTENTS

Number 1

M. Flasiński	1	On the parsing of deterministic graph languages for syntactic pattern recognition
Guangzheng Yang	17	The search algorithms stimulated by premise set in the syntactic knowledge system
Soo-Chang Pei and Lin-Gwo Liou	23	Tracking a planar patch in three-dimensional space by affine transformation in monocular and binocular vision
Z. Chen and S.-Y. Ho	33	Incremental model building of polyhedral objects using structured light
C.-H. Lee and A. Joshi	47	Correspondence problem in image sequence analysis
M. Kirby, F. Weisser and G. Dangelmayr	63	A model problem in the representation of digital image sequences
Y.-L. Chang, X. Lebegue and J. K. Aggarwal	75	Calibrating a mobile camera's parameters
G. M. Cortelazzo, G. Deretta, G. A. Mian and P. Zamperoni	89	On the application of geometrical form description techniques to automatic key-section recognition
Shan Liu-Yu and M. Thonnat	95	Description of object shapes by apparent boundary and convex hull
B.-C. Li	109	A new computation of geometric moments
Y.-Q. Cheng, Ke Liu and J.-Y. Yang	115	A novel feature extraction method for image recognition based on similar discriminant function (SDF)
C. L. Tan and S. K. K. Loh	127	Efficient edge detection using hierarchical structures
C.-M. Wu and Y.-C. Chen	137	Multi-threshold dimension vector for texture analysis and its application to liver tissue classification
T. F. Cox and G. Ferry	145	Discriminant analysis using non-metric multi-dimensional scaling
B. Dubuisson and M. Masson	155	A statistical decision rule with incomplete knowledge about classes
J. Flusser and T. Suk	167	Pattern recognition by affine moment invariants
Jin Wang and J. Jean	175	Resolving multifont character confusion with neural networks

Dit-Yan Yeung 189 Constructive neural networks as estimators of Bayesian discriminant functions

Software Survey Section I

Number 2

T. H. Hildebrandt and W. Liu 205 Optical recognition of handwritten Chinese characters: advances since 1980

K. Toraichi 227 On a method of automatically compressing fonts with high resolution

S. Oe 237 Texture segmentation method by using two-dimensional AR model and Kullback information

J. You and H. A. Cohen 245 Classification and segmentation of rotated and scaled textured images using texture "tuned" masks

C.-K. Lin, K.-C. Fan and F. Tze-Pa Lee 259 On-line recognition by deviation-expansion model and dynamic programming matching

D. Skea, I. Barrodale, R. Kuwahara and R. Poeckert 269 A control point matching algorithm

T.-W. Kao, S.-J. Horng, Y.-L. Wang and K.-L. Chung 277 A constant time algorithm for computing Hough transform

C.-W. Fu, J.-C. Yen and S. Chang 287 Calculation of moment invariants via Hadamard transform

S. Ghosal and R. Mehrotra 295 Orthogonal moment operators for subpixel edge detection

J. H. Yoo and I. K. Sethi 307 An ellipse detection method from the polar and pole definition of conics

H. Yan 317 Prototype optimization for nearest neighbor classifiers using a two-layer perceptron

R. H. Glendinning 325 Auto-regressive shape classifiers in time varying noise

C.-Y. Hsia and C.-L. Huang 333 Visual events' identification of solids of revolution from perspective views

W.-S. Chou and Y.-C. Chen 351 Estimation of the velocity field of two-dimensional deformable motion

LiMin Fu, M. Yang, R. Braylan and N. Benson 365 Real-time adaptive clustering of flow cytometric data

Note

I. Barrodale, D. Skea, M. Berkley, R. Kuwahara and R. Poeckert 375 Warping digital images using thin plate splines

Corrigendum 377

Software Survey Section I

Number 3

HANDWRITING PROCESSING AND RECOGNITION

Guest Editor: Réjean Plamondon

Editorial

R. Plamondon 379 Handwriting processing and recognition

C. Nadal and C. Y. Suen 381 Applying human knowledge to improve machine recognition of confusing handwritten numerals

T. Paquet and Y. Lecourtier 391 Recognition of handwritten sentences using a restricted lexicon

G. Boccignone, A. Chianese, L. P. Cordella and A. Marcelli 409 Recovering dynamic information from static handwriting

W. Guerfali and R. Plamondon 419 Normalizing and restoring on-line handwriting

Y. Qiao and G. Leedham 433 Segmentation and recognition of handwritten Pitman shorthand outlines using an interactive heuristic search

L. Schomaker 443 Using stroke- or character-based self-organizing maps in the recognition of on-line, connected cursive script

P. Morasso, L. Barberis, S. Pagliano and D. Vergano 451 Recognition experiments of cursive dynamic handwriting with self-organizing networks

Number 4

T. Caelli and D. Reye 461 On the classification of image regions by colour, texture and shape

J.-S. Wu and J.-J. Leou 471 New polygonal approximation schemes for object shape representation

J.-C. Lin 485 Universal principal axes: an easy-to-construct tool useful in defining shape orientations for almost every kind of shape

D. C. D. Hung 495 Non-conventional algorithm for representing and recognizing complicated two-dimensional objects

B. K. Ray and K. S. Ray	505	Determination of optimal polygon from digital curve using L_1 norm
E.-H. Liang and E. K. Wong	511	Hierarchical algorithms for morphological image processing
N. Ansari and K. Li	531	Landmark-based shape recognition by a modified Hopfield neural network
N. R. Pal, P. Pal and A. K. Basu	543	A new shape representation scheme and its application to shape discrimination using a neural network
E. C.-K. Tsao, W.-C. Lin and C.-T. Chen	553	Constraint satisfaction neural networks for image recognition
H.-F. Pai and H.-C. Wang	569	A two-dimensional cepstrum approach for the recognition of Mandarin syllable initials
F.-H. Cheng, W.-H. Hsu and M.-C. Kuo	579	Recognition of handprinted Chinese characters via stroke relaxation
K. Rangarajan, W. Allen and M. Shah	595	Matching motion trajectories using scale-space
L. J. Buturović	611	Improving k-nearest neighbor density and error estimates
C. H. Li and C. K. Lee	617	Minimum cross entropy thresholding
Y. Y. Tang, X. Cheng, L. Tao and C. Y. Suen	627	Parallel regional projection transformation (RPT) and VLSI implementation
D. K. Y. Chiu and G. Harauz	643	A method for inferring probabilistic consensus structure with applications to molecular sequence data
Software Survey Section	I	

Number 5

Z. Chen, C.-M. Wang and S.-Y. Ho	655	An effective search approach to camera parameter estimation using an arbitrary planar calibration object
J. M. Galvez and M. Canton	667	Normalization and shape recognition of three-dimensional objects by 3D moments
C.-C. Chen	683	Improved moment invariants for shape discrimination
C. Yüceer and K. Oflazer	687	A rotation, scaling, and translation invariant pattern classification system
H.-D. Chang and J.-F. Wang	711	Preclassification for handwritten Chinese character recognition by a peripheral shape coding method

H. Mhidra, J. Brochard and M. Leard 721 AR models and bidimensional discrete moments applied to texture modelling and recognition

L. Spirkovska 727 Three-dimensional object recognition using similar triangles and decision trees

T. Caelli and A. Pennington 733 An improved rule generation method for evidence-based classification systems

K. Hattori and Y. Torii 741 Effective algorithms for the nearest neighbor method in the clustering problem

C. Cocozza-Thivent and A. Bekkhoucha 747 Estimation in Pickard random fields and application to image processing

A. Veijanen 763 Contextual estimators of mixing probabilities for Markov chain random fields

C. E. Priebe and D. J. Marchette 771 Adaptive mixture density estimation

B. Brillault-O'Mahony and T. J. Ellis 787 A maximum likelihood approach to feature segmentation

Y. M. Sharaiha and P. Garat 799 A compact chord property for digital arcs

D.-C. Tseng and W.-S. Shieh 805 Plume extraction using entropic thresholding and region growing

Software Survey Section I

Number 6

J. C. Campos, A. D. Linney and J. P. Moss 819 The analysis of facial profiles using scale space techniques

Y.-S. Chen, S.-L. Chang and W.-H. Hsu 825 An improved line continuation model in human visual perception

X. Li, N. S. Hall and G. W. Humphreys 843 Discrete distance and similarity measures for pattern candidate selection

J.-S. Lee, Y.-N. Sun, C.-H. Chen and C.-T. Tsai 853 Wavelet based corner detection

J.-Y. Yang and C.-C. Chen 867 Decomposition of additively separable structuring elements with applications

K. Tsirikolias and B. G. Mertzios 877 Statistical pattern recognition using efficient two-dimensional moments with applications to character recognition

B. Yu and B. Yuan 883 A more efficient branch and bound algorithm for feature selection

M. Kudo and M. Shimbo	891	Feature selection based on the structural indices of categories
K. Liu, Y.-Q. Cheng and J.-Y. Yang	903	Algebraic feature extraction for image recognition based on an optimal discriminant criterion
J. H. Park, T. G. Chang and J. S. Choi	913	Three-dimensional object representation and recognition based on surface normal images
A. Goshtasby and W. A. Gruver	923	Design of a single-lens stereo camera system
S. H. Hwang and S. U. Lee	939	A hierarchical optical flow estimation algorithm based on the interlevel motion smoothness constraint
D. E. Brown, V. Corruble and C. L. Pittard	953	A comparison of decision tree classifiers with back-propagation neural networks for multimodal classification problems
S. Banerjee and A. Rosenfeld	963	Model-based cluster analysis
R. S. Valiveti and B. J. Oommen	975	Determining stochastic dependence for normally distributed vectors using the chi-squared metric
		Letter to the Editor
C. R. O. Lawoko and C. Y. J. Fu	989	A note on reporting of results which are functions of the Mahalanobis distance, Δ
Announcement	991	
Software Survey Section	I	

Number 7

B. Simard, B. Prasada and R. M. K. Sinha	993	On-line character recognition using handwriting modelling
I. S. I. Abuhaiba and P. Ahmed	1009	Restoration of temporal information in off-line Arabic handwriting
M. H. Singer	1019	A general approach to moment calculation for polygons and line segments
S. Loncaric and A. P. Dhawan	1029	A morphological signature transform for shape description
Q.-G. Gao and A. K. C. Wong	1039	Curve detection based on perceptual organization
B. G. Sherlock and D. M. Monro	1047	A model for interpreting fingerprint topology
C.-T. Tsai, Y.-N. Sun, P.-C. Chung and J.-S. Lee	1057	Endocardial boundary detection using a neural network

A. K. Gupta, S. Chaudhury and G. Parthasarathy 1069 A new approach for aggregating edge points into line segments

J. Henikoff and L. G. Shapiro 1087 Representative patterns for model-based matching

P. Kr. Biswas, J. Mukherjee and B. N. Chatterji 1099 Component labeling in pyramid architecture

I. M. Parker 1117 Finding the overlap integral between two classes of object

Letters to the Editor

T.-H. Cho 1121 Comments on "An efficient agglomerative clustering algorithm using a heap"

T. Kurita 1121 Author's reply

Announcement 1123

Software Survey Section I

Number 8

P. D. Sozou and G. Loizou 1125 New perspectives on optical flow

C. Q. Shu and Y. Q. Shi 1137 Direct recovering of Nth order surface structure using unified optical flow field

Siwei Lu and A. Szeto 1149 Hierarchical artificial neural networks for edge enhancement

V. V. Starovoitov, S. V. Ablameyko, S. Ishikawa and E. Kawaguchi 1165 Binary texture border extraction on line drawings based on distance transform

M. Hild and Y. Shirai 1177 Extraction of texture elements from images of shaded scenes

S. Denslow, Z. Zhang, R. P. Thompson and C. F. Lam 1193 Statistically characterized features for directionality quantitation in patterns and textures

V. V. Vinod and S. Ghose 1207 Point matching using asymmetric neural networks

S. R. Kona, J. W. Foster and J. V. Varughese 1215 A robust algorithm for detecting pinholes in transparent plastic films

Bingcheng Li 1229 The moment calculation of polyhedra

X. Xie, R. Sudhakar and H. Zhuang 1235 Corner detection by a cost minimization approach

T. Masuda, K. Yamamoto and H. Yamada 1245 Detection of partial symmetry using correlation with rotated–reflected images

B. Olstad 1255 Reasoning with entropy graphs for image operators

Software Survey Section I

Number 9

N. R. Pal and S. K. Pal 1277 A review on image segmentation techniques

J. M. Jolion 1295 A hierarchical framework for robust extraction and delineation of geometric features

D. Ziou and S. Tabbone 1305 A multi-scale edge detector

X. Li and N. S. Hall 1315 Corner detection and shape classification of on-line handprinted Kanji strokes

I. S. I. Abuhaiba and P. Ahmed 1335 A fuzzy graph theoretic approach to recognize the totally unconstrained handwritten numerals

C. Lenart 1351 Defining separability of two fuzzy clusters by a fuzzy decision hyperplane

K. S. Al-Sultan and S. Z. Selim 1357 A global algorithm for the fuzzy clustering problem

G. Sapiro, R. Kimmel, D. Shaked, B. B. Kimia and A. M. Bruckstein 1363 Implementing continuous-scale morphology via curve evolution

R. Dale-Jones and T. Tjahjadi 1373 A study and modification of the local histogram equalization algorithm

P. Rosin and S. Venkatesh 1383 Extracting natural scales using Fourier descriptors

J. Boberg and T. Salakoski 1395 General formulation and evaluation of agglomerative clustering methods with metric and non-metric distances

Weidong Min, Zesheng Tang and Long Tang 1407 Using web grammar to recognize dimensions in engineering drawings

P. Cucka and A. Rosenfeld 1417 Evidence-based pattern-matching relaxation

H. C. Shen, C. Y. C. Bie and D. K. Y. Chiu 1429 A texture-based distance measure for classification

Announcement 1439

Software Survey Section I

Number 10

L. Coetzee and E. C. Botha	1441	Fingerprint recognition in low quality images
Wei Wen and A. Lozzi	1461	Recognition and inspection of manufactured parts using line moments of their boundaries
J. M. Westall and M. S. Narasimha	1473	Vertex directed segmentation of handwritten numerals
M. H. Benteftifa and L. Kurz	1487	Feature detection via linear contrast techniques
W.-Y. Wu and M.-J. J. Wang	1499	Elliptical object detection by using its geometric properties
R. V. Shankar and S. Ranka	1511	Parallel vision algorithms using sparse array representations
J. Moody, P. J. Flynn and D. L. Cohn	1521	Parallel hypothesis verification
S. K. Nayar and R. M. Bolle	1529	Computing reflectance ratios from an image
A. Goshtasby	1543	Recovering scene structures from scattered surface points
D. Ben-Tzvi, A. Del Bimbo and P. Nesi	1549	Optical flow from constraint lines parametrization
C. Arcelli and G. Ramella	1563	Finding contour-based abstractions of planar patterns
J. K. Lee, M. Kabrisky, M. E. Oxley, S. K. Rogers and D. W. Ruck	1579	The complex cepstrum applied to two-dimensional images
B. Pinkowski	1593	Multiscale Fourier descriptors for classifying semivowels in spectrograms
Software Survey Section	I	

Number 11

V. Caglioti	1603	The planar three-line junction perspective problem with application to the recognition of polygonal patterns
W. Philips	1619	A new fast algorithm for moment computation
N. Kiryati and G. Székely	1623	Estimating shortest paths and minimal distances on digitized three-dimensional surfaces
M. Magee, R. Weniger and D. Wenzel	1639	Multidimensional pattern classification of bottles using diffuse and specular illumination
Z.-Q. Hong and J.-Y. Yang	1655	An algorithm for camera calibration using a three-dimensional reference point
D. C. D. Hung	1661	Enhancement and feature purification of fingerprint images

E-ren Chuang and D. Sher	1673	χ^2 test for feature detection
G. Vernazza	1683	Image classification by extended certainty factors
I. Y. Kim and H. S. Yang	1695	Efficient image labeling based on Markov Random Field and error backpropagation network
Z. Chen	1709	Grammar mapping for conceptual patterns
R. Anand, K. Mehrotra, C. K. Mohan and S. Ranka	1717	Analyzing images containing multiple sparse patterns with neural networks
A. Chatterjee, P. P. Das and S. Bhattacharya	1725	Visualization in linear programming using parallel coordinates
Announcement	1737	
Software Survey Section	I	

Number 12

G. Chow and X. Li	1739	Towards a system for automatic facial feature detection
A. Dutta and S. Chaudhury	1757	Bengali alpha-numeric character recognition using curvature features
J. R. Ullmann	1771	Edge replacement in the recognition of occluded objects
P. Bhattacharya, K. Qian and X. Lu	1785	An algebraic approach for morphological operations on 2D and 3D images
H. Bunke and U. Bühler	1797	Applications of approximate string matching to 2D shape recognition
O. E. Agazzi and S. Kuo	1813	Hidden Markov model based optical character recognition in the presence of deterministic transformations
J. Z. C. Lai	1827	Tracking multiple features using relaxation
H.-T. Sheu and H.-Z. Yang	1839	Open curve segmentation via a two-phase scheme
G. Bongiovanni, L. Cinque, S. Levialdi and A. Rosenfeld	1845	Image segmentation by a multiresolution approach
B. Yan	1855	Semiconormed possibility integrals and multi-feature pattern classification
Y. Hamamoto, T. Kanaoka and S. Tomita	1863	On a theoretical comparison between the orthonormal discriminant vector method and discriminant analysis
Software Survey Section	I	
Volume Contents and Author Index for Volume 26, 1993	V	